The Beagle, Records of the Museums and Art Galleries of the Northern Territory, 1996 **13**: 53-60

A NEW SPECIES OF *RAMPHOTYPHLOPS* (SQUAMATA: TYPHLOPIDAE) FROM THE DARWIN AREA, WITH NOTES ON TWO SIMILAR SPECIES FROM NORTHERN AUSTRALIA.

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ABSTRACT

A new species of *Ramphotyphlops* is described from the Darwin area, northern Australia. It differs from all other *Ramphotyphlops* in the combination of 16 midbody scale rows with a high number of ventral scales. Additional records of *R. minimus* (Kinghorn, 1929) are reported, including the first record from mainland Australia. *Ramphotyphlops guentheri* (Peters, 1865) shows discontinuous geographically-linked variation in number of ventral scales. The name *R. nigricauda* (Boulenger, 1895) is applicable to the eastern form, while *R. guentheri* applies to the western form.

KEYWORDS: Squamata, Typhlopidae, *Ramphotyphlops*, new species, Darwin, Northern Territory, Australia.

INTRODUCTION

The family Typhlopidae, represented by the genus *Ramphotyphlops*, remains among the least studied and most poorly known elements of the Australian herpetofauna, both taxonomically and ecologically. The most recent taxonomic treatment of the family throughout Australia is by Waite (1918), although Storr (1981) revised the Western Australian members of the family. One of the major deficiencies in knowledge is the systematics and distribution of the family in northern Australia. This deficiency is primarily due to the serendipitous nature of typhlopid collections in a region of sparse settlement, resulting in small scattered samples. For example, Waite (1918) had material from only 28 localities north of the Tropic of Capricorn (23°30'S), while over half a century later, Storr (1981) had only eight specimens from the north Kimberley. Despite this paucity of material, it is becoming apparent that northern Australia is a major centre of diversity for typhlopids. Of the 34 species of Australian *Ramphotyphlops*, 22 species occur in tropical Australia, and 17 species are restricted to that zone. This latter number includes nine of the 15 species described since Waite's (1918) revision.

This paper describes another new species of *Ramphotyphlops* from northern Australia, provides data on distribution and morphology of two similar species, *R. guentheri* (Peters, 1865) and *R. minimus* (Kinghorn, 1929), and gives preliminary data suggesting that *R. guentheri* is composite. Although the male genitalia of these species remain to be examined, and hence their generic identity is not confirmed (Robb 1966), they are tentatively assigned to *Ramphotyphlops* on the basis of geography (only *Ramphotyphlops* is known from Australia) and a shared supralabial imbrication pattern (McDowell 1974; Wallach 1993).

MATERIALS AND METHODS

Typhlopid holdings of all institutional collections in Australia were searched for specimens of the new species, together with material of *R. guentheri* and *R. minimus*. Individuals of the new species were found among material assigned to the latter two species. Collection abbreviations are as follows: Australian Museum - AM; Australian National Wildlife Collection - ANWC; Natural History Museum, London - BMNH; Museum of Victoria - MV; Museum

and Art Gallery of the Northern Territory - NTM; Queensland Museum - QM; South Australian Museum - SAM; Western Australian Museum - WAM. Other abbreviations are: snout-vent length - SVL; body width - BW; homestead - HS.

Head scalation nomenclature follows Waite (1918). Ventral scale counts are from the postmental to the preanal scales inclusive. Subcaudal scale counts do not include the terminal thornlike scale. Whenever possible sex was determined by examination of the gonads: females on the presence of either ovaries or a right oviduct, males by the presence of testes and ductus deferens.

SYSTEMATICS

Ramphotyphlops nema sp. nov.
(Figs 1-2)

Type material. HOLOTYPE - NTM R21665, Fannie Bay, Darwin, NT. Collected 8 December 1995 by D. Low Choy. PARATYPES - AM A4872, Port Darwin, NT (no other data); MV D8408, Darwin, NT, donated C.P. Crawford; NTM R16047, Malak, Darwin, NT, R. Horner, 10 April 1990; NTM R34110, Darwin, NT, L. Brodie, December 1965; SAM R802B, northern Australia.

Diagnosis. A small, slender *Ramphotyphlops* with 16 midbody scale rows, 520 or more ventral scales, snout bluntly rounded from above and in lateral profile, and tail concolorous with body.

Description. Head in profile rounded, convexity slightly greater rostroventrally than rostrodorsally; head in dorsal view bluntly rounded, slightly squared off, lacking indentations lateral to rostral; rostral large, from above as wide as long, slightly tapered caudally, about 1/3 width of head; ventral lobe narrower, tapering caudally, lateral margins concave; nasals broadly separated by prefrontal; prefrontal and frontal subequal; supraoculars broadly separated by frontal; nostrils inferior, near apex of snout, closer to rostral than preocular, opening later-

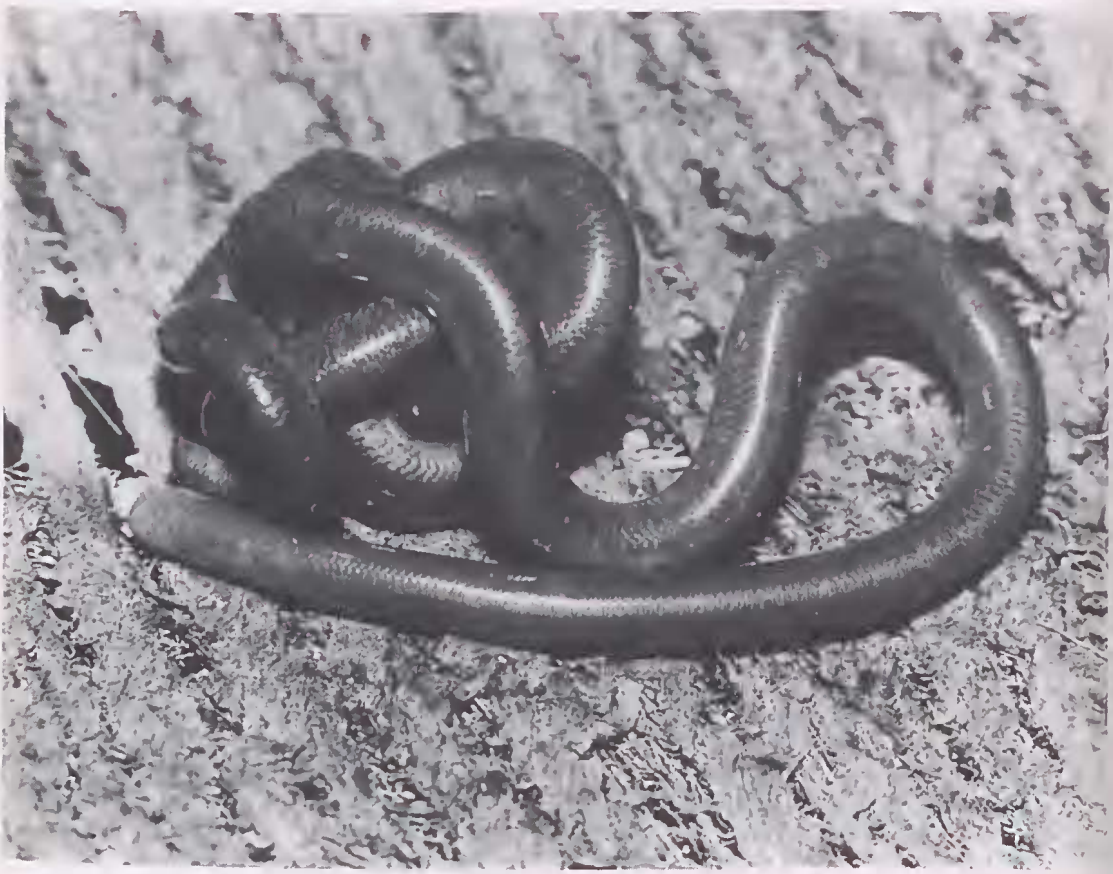

Fig. 1. Holotype of *Ramphotyphlops nema* n. sp. in life.

ally; nasal cleft beginning at second supralabial, extending across rostroventral margin of nostril, then passing dorsally and slightly rostrally to terminate about 1/2-2/3 the distance from nostril towards rostral, not visible from above; preocular about as wide as nasal, narrower than ocular; eye small, indistinct, deep to preocular/ocular suture, and immediately ventral to preocular/ocular/supraocular junction; ocular caudally overlaps three scales of equal size, one parietal and two postoculars; first supralabial smallest, overlapped by rostral lobe of nasal; second supralabial larger, overlapped by rostral lobe and caudal lobe of nasal and preocular; third supralabial larger, overlapped by preocular, but strongly overlapping ocular; fourth supralabial much the largest, elongate, overlapped by ocular; mental subequal to postmental; infralabials three, subequal; microtubercles of head shields most dense on nasal scute; glands below margins of head shields present but not prominent.

Midbody scale rows 16; ventral scales 520-589 ($\bar{x}$ = 556.3, sd = 25.0, n = 6), 544 in two females; subcaudal scales 9-14 ($\bar{x}$ = 10.4, sd = 2.1, n = 5), 10 in two females.

SVL 120-268mm ($\bar{x}$ = 192.0, sd = 62.2, n = 6), two of three largest individuals female; BW (%SVL) 1.08-1.75 ($\bar{x}$ = 1.36, sd = 0.23, n = 6).

In alcohol, head, body and tail dorsum light yellow-brown to mid grey-brown, concolorous or with head slightly darker; venter slightly paler. In life, cranial third of dorsum pinkish brown.

Details of holotype. The holotype has SVL 268 mm, BW 3.35 mm, 589 ventral scales and nine subcaudal scales.

Comparison with other species. The combination of 16 midbody scales, 520 or more ventral scales and a bluntly rounded snout is unique among *Ramphotyphlops*. Only two described species have 16 midbody scales: *R. minimus* (Kinghorn, 1929) and *R. leptosoma* Robb, 1972. *Ramphotyphlops minimus* also shares a bluntly rounded snout with *R. nema* and is geographically close (see below). However, it differs in having a much lower ventral count (457 or fewer) and in usually having at least a dark tail, and often a dark head and striped body.

Ramphotyphlops leptosoma shares a high ventral count and concolorous body and tail with *R. nema*, but has a bluntly angular snout in profile, and a completely divided nasal scale. It is also geographically distant.

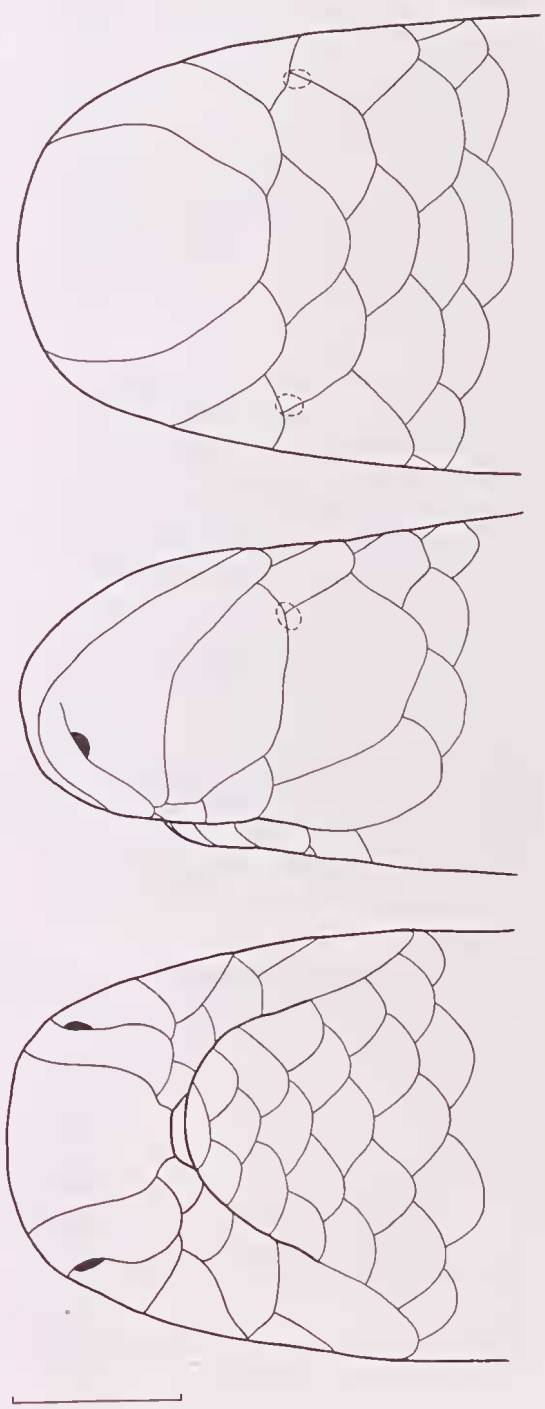

Fig. 2. Dorsal, lateral and ventral views of the head of a paratype of *Ramphotyphlops nema* n. sp. (AM A4872). Scale bar = 1mm.

Two species of *Ramphotyphlops* with 18 midbody scale rows have similarly high ventral counts to *R. nema*: *R. grypus* (Waite, 1918) and *R. guentheri* (Peters, 1865). *Ramphotyphlops grypus* differs in having a strongly hooked snout in profile, and a dark tail.

Early records of *R. nema* were incorrectly identified as *R. guentheri* (AM A4872; SAM R802B; MV D8408; at least the first two identified as such by Waite), with which it shares a rounded snout. However, the latter species differs in having a black tail, the nasal cleft scarcely extending beyond the nostril, and a characteristically truncate caudal extremity to the rostral scale.

Distribution and conservation status. All records of *R. nema* with specific localities are from the Darwin area. In addition to the type series, AM R2292, received in exchange from SAM in 1897 without further data and in poor condition, belongs to this species, while SAM R802A, previously identified as conspecific with R802B and sharing the same data, was skeletonised prior to this study, and its identity cannot now be confirmed. Of these eight specimens, four were registered prior to 1918, while one (MV D8408) was received in 1952. Despite extensive collections of reptiles from Darwin, a rapidly expanding city in recent decades, only the holotype and two NTM paratypes have been collected since 1965.

Using the quantitative ranking adopted by Cogger *et al.* (1993) to assess conservation status, and conservatively extrapolating some variables from congeners, we score *R. nema* as 35.4 (1(b); 2(b); 3(a); 4(d); 5(d); 6A(b); 6B(c); 7A(ii); 7B(b); 7C(b)). This score is within the range of scores assigned to the "Vulnerable" category.

Habitat. Habitat data are available only for the two most recently collected specimens, the holotype and paratype NTM R16047. Both were collected in heavily vegetated suburban backyards, which had in common areas of dark humic soil covered with thick leaf litter. Both specimens were located under debris embedded in the substrate, with the holotype being found under a concrete slab and the paratype under a loose pile of house bricks. *Ramphotyphlops braminus* has also been recorded at one of these sites.

Etymology. From the classical Greek *nema*, a thread, alluding to the slender body, which combines the lowest midbody counts in the genus with some of the highest ventral counts.

Ramphotyphlops minimus (Kinghorn, 1929)

This species was stated to be described from a holotype and two paratypes from Groote Eylandt (Kinghorn 1929). However, the paratypes are among three conspecific specimens then registered under one number, and it is not possible to determine whether Kinghorn erred in identifying only two paratypes, or if not, which two of the three individuals are paratypes. An additional specimen from Groote Eylandt was noted

Table 1. Comparison of variable characters between eastern and western populations of *Ramphotyphlops guentheri*.

			SVL	BW (%SVL)	Ventrals	Subcaudals
Eastern	Females	Range	119-292	1.23-2.27	464-547	8-15
		$\bar{x}$	211.4	1.64	515.3	11.5
		sd	40.6	0.26	23.7	1.69
		n	21	21	21	21
	Male (n = 1)		192.5	1.90	508	17
	Pooled (females and male)	Range	118-292	1.23-2.72	464-547	8-17
		$\bar{x}$	197.5	1.66	514.8	11.6
		sd	48.1	0.26	22.4	1.96
		n	26	26	25	26
Western	Females	Range	138.5-280	1.21-1.65	564-610	10-15
		$\bar{x}$	227.3	1.41	584.3	12.8
		sd	52.1	0.15	15.8	1.83
		n	8	8	8	8
	Pooled (females and unsexed)	Range	132-280	1.21-1.79	564-610	10-15
		$\bar{x}$	211.4	1.47	582.3	12.2
		sd	53.5	0.19	13.5	1.75
		n	12	12	12	12

by Gow (1981), but not characterised, while Wilson and Knowles (1988) provide a colour photograph of a preserved individual from Lake Evella, on the mainland. We have examined all of these specimens, together with three others.

The following description encompasses the variation in taxonomically important characters in these nine specimens: nasal cleft originating from the second supralabial, and extending beyond the nostril towards the rostral, but not completely dividing the nasal and not visible dorsally; snout rounded in lateral profile, and slightly squared off in dorsal profile; midbody scales 16; ventrals 381-457 ($\bar{x}$ = 438.0, sd = 22.1, n = 9), in three females 441-457, in two males 444-445. The only individual with ventral count below 438 is NTM R7521, which is also unique in coloration (see below). Subcaudals 9-17 ($\bar{x}$ = 11.6, sd = 2.51, n = 9), in three females 9-11, in two males 12-14.

The SVL is 109-215mm ($\bar{x}$ = 166.9 mm, sd = 36.0 mm, n = 9), in three females 109-189 mm,

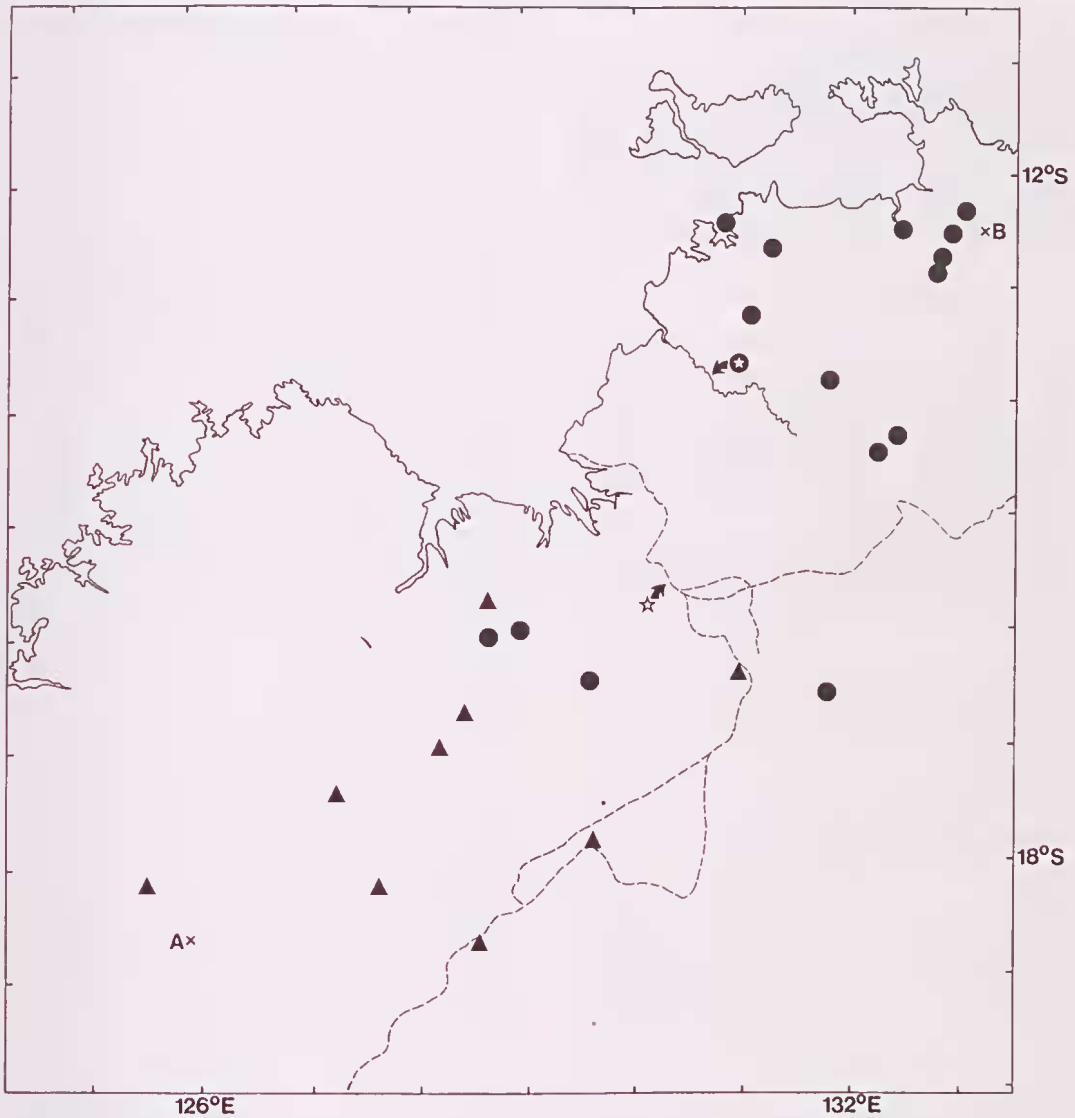

Fig. 3. Distribution of *Ramphotyphlops guentheri*. Dots indicate the eastern form; triangles, the western form; starred dot indicates the Daly River, type locality for *Typhlops nigricauda*; star indicates most likely locality for type of *Typhlops guentheri*. Dashed line indicates approximate routes followed by Gregory's Northern Australian Expedition of 1855-56. Crosses A and B indicate transect plotted in Figure 4.

in two males 177.5-202 mm; BW (%SVL): 1.42-1.94 ($\bar{x}$ = 1.63, sd = 0.19, n = 9), in three females 1.43-1.85, in two males 1.53-1.94.

The head and tail are much darker than body, and body usually with narrow dark stripes, at least ventrally. The exception is NTM R7521 (SVL 176 mm) which lacks stripes and has the head and tail concolorous with the body.

Geographic variation. The single mainland specimen, an adult male, from a locality approximately 170 km NNW of Groote Eylandt, falls within the range of variation of Groote Eylandt material.

Specimens examined. AM R9692 (holotype), R9693, R61025-26 (paratypes), Groote Eylandt, NT; AM R10367, northern Australia; AM R40918, Lake Evella, NT; AM R71301, Angurugu Mission, Groote Eylandt, NT; NTM R7521, Mayada, Groote Eylandt, NT; NTM R9874, Angurugu, Groote Eylandt, NT.

Ramphotyphlops guentheri (Peters, 1865)

This species was described from a single specimen from "Nordaustralien" in the British Museum. The holotype (BMNH 1946.1.10.88) was collected by the North Australian expedition of 1855-56 led by A.C. Gregory, with naturalist J.R. Elsey. Although no more specific locality is available, it is likely that it was collected from the major campsite of the expedition on the Victoria River, NT, where Elsey, together with most of the party, stayed from October 1855 to June 1856 while Gregory explored to the southwest (Gregory and Gregory 1884). After this date, the expedition travelled rapidly east, beyond the known range of the species.

Boulenger (1895) described *Typhlops nigricauda* from two specimens from the Daly River, but did not compare it with *R. guentheri*. The two species were synonymised by Waite (1918) without examination of type material.

Examination of all available material of *R. guentheri* in Australian collections reveals that ventral scale counts are discontinuous. Eastern material, from Wyndham to Oenpelli, has low numbers of ventral scales (547 or fewer), while western material, from Fitzroy Crossing to "Victoria River Downs" HS, has high numbers of ventral scales (564 or more; Table 1). There is geographic overlap between these two groups in the east Kimberley and adjacent parts of the Northern Territory (Figs 3-4), although syntopy is not yet recorded. The holotype of *Typhlops guentheri*, with ventral scale count of 568, belongs to the western group, while one of the two syntypes of *Typhlops nigricauda* (BMNH 1946.1.11.13, here designated lectotype) is assignable to the eastern group on locality (Fig. 3) and ventral scale count (530).

No other obvious variation between or within these two groups was apparent (Table 1). In the absence of concordant variation in independent characters, genetic data or evidence of repro-

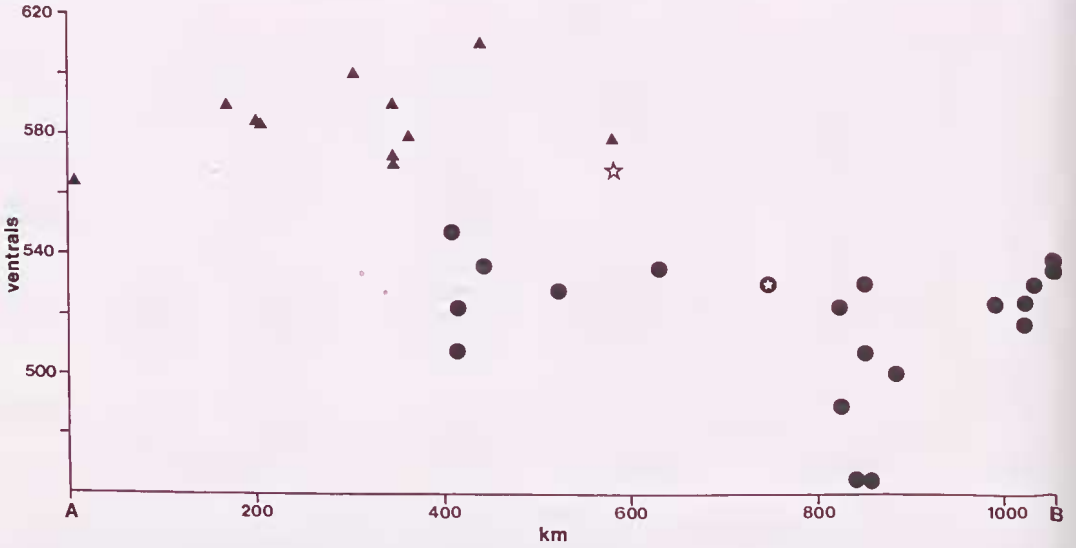

Fig. 4. Geographic variation in number of ventral scales in *Ramphotyphlops guentheri*. X axis is km from point A to point B on Figure 3. Symbols as in Figure 3.

ductive isolation by the occurrence of syntopy, we are reluctant to formally recognise these two groups as distinct species. Much additional material, preferably with accompanying genetic studies (Aplin and Donnellan 1993), is required to resolve the status of these two groups.

An additional pecularity in *R. guentheri* is the preponderance of females in the available samples. Of 22 sexed individuals of the eastern group, 21 are females, based on the presence of either ovaries and/or an oviduct, while only one (WAM R61353) is a male. All eight individuals of the western group which were sexable by internal examination are female, and the remainder had similarly proportioned tails and similar subcaudal counts. These sex ratios are highly significantly different from equality (eastern: $c^2 = 16.4$, $p<0.001$; western: $c^2 = 6.1$, $p<0.05$). Whether this highly skewed sex ratio is real or an artefact of collection is at present unknown. If real, its biological significance will require much additional ecological and genetic data. However, it is worthy of note that at least one other typhlopid, *Ramphotyphlops braminus* (Daudin, 1803) is a triploid parthenogen (Wynn *et al.* 1987; Ota *et al.* 1991), yet uncomfirmed reports of occasional males exist (see Nussbaum 1980 for discussion).

Specimens examined. *Eastern form.* ANWC R3604, Jabiru area, NT; ANWC R5120, Noranda Camp, Nourlangie Rock area, NT; BMNH 1946.1.11.13, Daly River, NT (lectotype of *Typhlops nigricauda*); MV R7073, NTM R915-16, Oenpelli, NT; MV D8801, NT; MV D11002, Dingo Gap, on WA border between Wyndham and Timber Creek, NT; MV R7111, NTM R9849, no data; NTM R2568, The Pines, Pine Creek, NT; NTM R4202, Adelaide River, NT; NTM R5180, Kapalga study area, NT; NTM R6932, Katherine, low level, NT; NTM R8690, Rock Hole, 68km E Pine Creek, NT; NTM R13553, R13611, Katherine Gorge camping area, NT; NTM R16488, Top Springs, NT; NTM R16907, Kakadu stage 3, NT; NTM R34103, Beatrice Hill, NT; QM J2266, Port Darwin, NT; WAM R21935, Katherine, NT; WAM R24006, Snake Creek, 12km N Adelaide River, NT; WAM R31520, Wyndham, WA; WAM R40997, "Kildurk", NT; WAM R61352, Lake Argyle, main dam site, WA; WAM R61353, "Argyle Downs" HS, WA.

Western form. BMNH 1946.1.10.88, north Australia (holotype of *Typhlops guentheri*); MV D4715, Turkey Creek, WA; NTM R284, "Gordon Downs", WA; NTM R2227, "Victoria River Downs" HS, NT; NTM R6741, 5 km W Ivanhoe Crossing, WA; SAM R14026, "Inverway" Stn, NT; WAM R26635, near Halls Creek, WA; WAM R28234, Fitzroy Crossing, WA; WAM R32283, Elgee Cliffs, WA; WAM R70322, 12 km WSW (new) "Lissadell" HS, WA; WAM R70361, 13 km NW (new) "Lissadell" HS, WA; WAM R70836, 12.5 km 309° (new) "Lissadell" HS, WA.

ACKNOWLEDGMENTS

We thank E.N. Arnold and C. McCarthy (BMNH), P. Couper (QM), J. Coventry (MV), M. Hutchinson and A. Edwards (SAM), R. Sadlier (AM), L. Smith (WAM) and J. Wombey (ANWC) for allowing us to examine specimens in their care, and B. Jantulik for preparing the final version of Fig. 2.

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Accepted 9 September, 1996